to all without any condition for admission or any examination, and the number of persons who have frequented it during the last few years amounts to from 150,000 to 180,000.

"To the honour of workmen it must be said, that a more attentive audience can nowhere be found; never does the slightest disorder arise, and I am happy to say that during the unhappy events which have taken place in France, the Conservatoire was always respected, and underwent no disturbance or invasion.

"But if we think the part of casual lecturers in the galleries useless, and if we are convinced that the real duty of the Conservatoire des-Arts-et-Métiers consists in the classification, maintenance and increase of its collections, and in the teaching of the applied sciences, which it gives on such a large scale, we also believe that the Government should attach great importance to that teaching, which, during twenty years, we have developed under the name of technical education, and which has produced such good results in several of our great industrial centres.

"Your department pursues the realisation of this wish, and we hope it will be able, with the aid of the resources placed at its disposal by the National Assembly, to develop more and more this practical instruction, which, beginning at the primary school, gradually enables men, according to their intelligence and love of study, to rise from the lowest to the highest grades of society."

NOTES

WE have with much regret to record the death of Mr. Edward Blyth, on December 27 last, in his sixty-fourth year. Of Mr. Blyth it may be said that he was a Zoologist in the truest sense of the word, and his practical knowledge of the birds and mammals of India and the surrounding countries was probably greater than that of any living naturalist. Up till 1840 he devoted himself to the study of the ornithology of the British Isles, and in that year appeared an English translation of Cuvier's "Regne Animale," in which the mammals, birds, and reptiles were edited by him; many of his own notes suggesting modifications in the then existing systems of classification, have been subsequently fully substantiated and adopted. For twenty-two years after this date Mr. Blyth held the post of Curator to the Calcutta Museum of the Asiatic Society of Bengal, during which time, and in conjunction with Dr. Jerdon, he did more than anyone to advance the study of Natural History in India, and to improve the value of the collection he controlled. After a short visit to Burmah, during which he did much good to zoological work, he returned to England in 1863, since which time he has contributed many valuable papers to ornithological and other journals, and under the very appropriate signature "Zoophilus," a large number of excellent articles to the *Field*. With an unparalleled memory Mr. Blyth combined exceptional powers of observation and a genuine enthusiasm for natural history, which is but rarely seen; these made his impromptu observations and opinions of more than ordinary value, and no one was more willing than himself freely to give all information at his command, towards the assistance of any fellow-worker, or the elucidation of any difficulty in his favourite subject.

DR. FRANCIS C. WEBB, editor of the *Medical Times* and *Gazette*, died suddenly on the morning of December 24 last, at the age of 47 years.

AT a preliminary meeting of the Varley Testimonial Committee, held on November 20, it was resolved to recommend that a Memoir of the late Cornelius Varley, illustrated with a Photographic Portrait, should be prepared and issued under the superintendence of the Committee, and that a copy be presented to his family, in token of the high estimation in which he was held; and further, that some Memorial be erected to his memory at the place of his interment.

TELEGRAMS from Naples of the 3rd and 4th inst., state that Prof. Palmieri announces a severe eruption of Vesuvius to be imminent. A rumbling noise is audible from the mountain, and although fire has not been seen in the interior of the craters, the density of the smoke indicates the proximity of fiery matter.

MR. MANLEY HOPKINS, Consul-General at Hawaii, having written to the *Times* that he had discovered in the Samoan Islands a living specimen of the Dodo, believed to have been extinct a century ago, Prof. Owen wrote to the same paper that the bird referred to is the dodlet. "The extinct dodo of the Island of Mauritius was about six times bulkier. Coloured figures of both birds—that of the dodo, copied from paintings by the Dutch artists, who saw the living bird in the time of their Stadtholder Maurice, that of the dodlet from the bird living in the Zoological Gardens about ten years ago, with the skeletons of both didus and didunculus are given in my work on the Dodo (quarto)."

A VERY suggestive anatomical point has been made out by Sir Victor Brooke, respecting the tarsus in certain of the *Cervidæ*. He finds that in the species of the genus *Cervulus* (the Muntjacs), the tarsus, instead of consisting of a naviculo-cuboid bone, together with two separate cuneiform bones, has the outer of the two cuneiform masses anchylosed to the naviculo-cuboid mass, to form a single bone, leaving the minute internal cuneiform free. In a very young specimen of *Cervulus muntjac* the cuboid was free, and the naviculare anchylosed to the outer cuneiform bones, showing that the tendency to blend in this direction is greater than that of the naviculare and the cuboid to combine. This same peculiarity is also found in the Pudu Deer of South America.

THE question as to the limit of capability of the microscope is investigated by Prof. Abbe, of Jena, in a recent number of Max. Schultze's *Archiv*; and he is led by a series of physical deductions to the remarkable result, that this limit is already as good as reached by our best microscopes, and that all hope of a deeper penetration into the material constitution of things, than such microscopes now afford, must be dismissed. Experiment and theory agree in showing how the changes wrought by diffraction of light passing through fine structures, whose elements are so small and near each other as to call forth this phenomenon, are such as to prevent the object being imaged *more geometrico*. Thus it may happen, on the one hand, that different structures give the same microscopical image, and, on the other, that like structures give different images. Consequently, while objects of the kind (systems of fine lines and the like) may appear ever so distinct and well marked in the microscope, we are not entitled to regard such appearances as of morphological significance, but merely as physical phenomena, from which nothing further can certainly be inferred than the presence of such structural conditions as are capable of producing the diffraction effects obtained. The remark has notable applications to many of the microscopical researches on markings of diatoms, and on striated muscular fibre. And it affects not merely the morphological relations of the objects, but the deductions, made from microscopical observation, as to properties (such as differences of transparence, colours, polarisation, &c.). The author lays down the following principle as basis for determination of a limit:—By no microscope can parts be distinguished (or the marks (*Merkmale*) of a really present structure perceived), if they are so near to each other that the first bundle of light rays produced by diffraction can no longer enter the objective simultaneously with the undiffracted cone of light. Prof. Abbe has also recently described a new illuminating apparatus for the microscope, formed of a condensing system of two unachromatic lenses, which are fixed in the stage of the microscope, and transmit the rays from the mirror below; the purpose being that the object (immediately above the upper lens) may be illuminated by light from a great many different directions.

WE have received from the Science and Art Department "Extracts from the Reports of the Professional Examiners in Science on the Examinations of May 1873." The reports are most thorough and painstaking analyses of the results of the examinations, and give one the conviction that there is little chance for candidates who are not masters of the subjects they profess. On the whole the examiners report unfavourably on the great bulk of the candidates, and it would be for the good of future candidates, especially such as expect to be able to pass by cramming, that these reports should be brought under their notice.

AN observation of particular interest has been made by Mr. C. S. Tomes (*Quarterly Journal of Microscopical Science*). In studying the development of the teeth of the Armadillo (*Tatusia peba*), he finds, contrary to what would have been expected, that in their earliest stages, the first indications of their differentiation are manifested by the formation of an "enamel organ" as in those of higher mammals; whereas in the teeth themselves there is no enamel present, as is well known. Another peculiarity is that behind each primitive tooth a second smaller sac is seen, which corresponds in all its relations with the germ of the permanent tooth in other mammalia. Consequently, *Tatusia peba* at least, amongst the *Dasypodidæ*, is not monophyodont, as has been previously stated by Rapp, Gervais, and Flower, from which it may be inferred that the Edentata as an order, must have descended from a truly diphyodont type, and have become subsequently specialised.

THE U.S. Exploring Expedition under Lieut.-Col. Wheeler has now brought its work nearly to a close, having surveyed about 100,000 miles of territory in Southern Colorado, Southern Utah, Eastern Arizona, and Western New Mexico. The entire geological formation of all this vast country has been carefully studied, and from this study and the survey, accurate maps will be drawn this winter. Over 1,000 species of plants have been collected in Southern Colorado, and over 500 in Arizona and New Mexico. Some plants, supposed to have medical properties, or such as might prove of technical use, have been taken along for investigation. For example, the muskal, which is used by the Indians as a principal article of food, is tasteless when raw, but upon cooking, by being embedded in hot coals, turns sweet and is like the best honey. Attention was also paid to the geographical distribution of plants, and many interesting points elucidated. With regard to the fauna, more than 800 bird skins have been collected and stuffed by one of the naturalists, many of them very rare and beautiful. Some very rare reptiles have also been obtained, among which the gilamonster forms a peculiar feature. This animal, which is repulsive in appearance to many, and generally believed to be exceedingly poisonous, is quite harmless and very interesting. Some new species of rattlesnakes have been found. Very few butterflies have been seen, but bugs and beetles were collected in great quantities. The waters of the different streams were searched for the finny tribe. Skulls of bears and mountain lions and other specimens of the animal creation are included in the list of collections. With regard to the Indians, many interesting facts have been collected; among others the vocabularies of seven languages—the Apache, Navajoe, Tehua, Gohun (Tonta Apaches), Waltoa (Jemes), Isletta, and Moquis.

WE notice with considerable satisfaction from the statistics published in the *Publishers' Circular* that the number of scientific works issued during the past year in England bears a very large proportion to other classes and to the whole number of works published. The number of new books and new editions published during 1873, including 242 importations from America, is 4,991. Of these, 588 are classed under the head "Arts, Sciences, and Historical Works," by which, we presume, is meant Science theoretical and applied and the history of Science, as there are other heads under which history and the fine arts more appropriately come. This number, 588, is inferior only to that of works of fiction, and theological and religious works, the former numbering 831, and the latter, second in the list for the first time, 770. Were we to class "Voyages, Travels, and Geographical Research," 283 volumes, among scientific works, the number would be 871, exceeding even that of works of fiction, not to mention theology. The number of *new* books in Arts, Science, and Geography is 593.

DR. E. REGEL, Director of the Botanical Gardens, St. Petersburg, has published a work on the species of vines met with in North America, Northern China, and Japan, in which he discusses the long-controverted question of the origin of the vine. According to him, the cultivated vine, which forms our vineyards and produces our wines, is not a distinct and separate botanic species; it is a hybrid of two species, belonging equally to the genus Vine, viz. *V. labrusca* L., and *V. vulpina* L. The former of these two species is met with in a wild state in Northern America, in Japan, in Mantchuria, and in the Himalayas. Its leaves have their inferior face covered abundantly with a cotton-like down. The second species, which grows naturally in the same countries, has upon the inferior face of its leaves only small hairs, short and very stiff upon the nerves. The first of these two species has furnished the two most remarkable varieties of American vines, the *Catawba*, much cultivated for the production of wine, and the *Isabella*, the grape of which, sought after for the table, has a perfumed flavour and peculiar odour, agreeable to some, but disagreeable to others.

ON Thursday evening last, by invitation of the Committee of the Post Office Library, a large company assembled in the galleries of the new Post Office buildings, St. Martin's-le-Grand, in commemoration of the reopening of the library. In the south-west gallery there was arranged a museum of early telegraphic instruments and appliances, the latest improvements in the science of telegraphy being illustrated by the mode of transmitting news to, and receiving messages simultaneously from, nineteen of the larger towns of the kingdom. The new process of despatching messages simultaneously in opposite directions through a single wire by the instrumentality of Mr. Stearn's invention was worked throughout the evening, communication having been effected for the purpose with Southampton. In the central gallery there were wires working in direct communication with Australia, India, Teheran, America, St. Petersburg, Paris, and Berlin, the process being rivalled in interest by the action of the pneumatic tubes which connect the Central Telegraph Station with the principal offices for the collection and delivery of messages in the metropolis. There was also in this gallery a working model of the travelling post-office, with the apparatus for the receipt and delivery of the mails while the train is in motion. In the course of the evening the Postmaster-General briefly addressed the company, sketching in outline the history of the English postal service. The Post Office Library was founded in 1859 for the benefit of the clerks and other officers of the Post Office. It was started by subscription among the employées, but has received large donations of books from authors, publishers, and the public. The library contains at present 2,500 volumes, of which we are glad to hear a fair proportion consists of popular scientific works, which it is hoped will be shortly increased.

MESSRS. LOVELL, REEVE, AND Co., have in the press a volume on St. Helena, comprising a physical, historical, and topographical description of the island, with its geology, fauna, flora, and meteorology. The author is Mr. J. C. Melliss, C.E., F.G S., F.L.S., late Commissioner of Crown Lands, Surveyor and Engineer of the Colony.

THE *Scotsman* reports that a piece of gold-bearing quartz has been found in the island of Bute.

BEE-KEEPING has become a vocation or avocation of so much importance in America that there actually exists a "North American Bee-keepers' Society," which, like more important associations, meets yearly in one of the towns of the States. This year the society met at Louisville and continued its sittings for several days. Among the papers read was one by General D. L. Adair against the practice, common among apiarians, of clipping the wings of the queen, the paper showing a very considerable acquaintance with the structure of the bee.

THE *Times* takes the following from an American paper, and asks "Why not in London?":—"In Pittsburg, Pennsylvania, an electric clock has been established to move the hands of seventy different clocks, scattered all over the city. The motive clock is powerful, and has a pendulum composed of hollow coils of copper wire. These swing to and fro over the poles of horse-shoe magnets, and every time they pass from one pole to the opposite a current of electricity is called up inductively in the coils, flows up the wire, and then to the seventy dials, giving a current of an opposite nature at each swing. Behind each dial is an astatic permanent magnet, suspended on a pivot, and surrounded by a coil of wire, and it rotates under the electric influence from the wires. A small weight may be used to each dial if the hands are heavy, and the pivoted magnet may merely regulate the time. Of course every clock will be exactly alike, and will run with very little attention. To prevent the pendulum of the motive clock from moving too fast by the increase in the length of vibration of the pendulum, a magnetic bridling apparatus is attached."

A LETTER appears in the *Times* of the 30th instant, from a correspondent with the "Livingstone East Coast Expedition," dated Mdaburu, Ugogo, Central Africa, July 15, and is principally occupied with a description of the many annoyances to which the expedition was subjected.

THE finest kitchen garden in France is that of Versailles, which belongs to the State, and brings in a yearly revenue, taking good and bad years together, of about 20,000f. The Assembly has determined to apply this valuable property to the formation of a model market garden and school of horticulture. The details of the institution are not yet arranged, but it is presumed that it will be self-supporting, and that it will render valuable assistance in the development of horticultural science in France.

THE additions to the Zoological Society's Gardens during the past week include two Violaceous Plantain-cutters (*Musophaga violacea*) from W. Africa, purchased; two Senegal Touracous (*Corythaix persa*) from W. Africa, presented by Mr. Hawkins; two Chinese Storks (*Ciconia Boycei*) from China, presented by Mr. R. B. Boyce of Shanghai; a Grivet Monkey (*Cercopithecus lalandii*) from W. Africa, presented by Mrs. Couteam; a Coati (*Nasua nasica*) from S. America; three Derbian Screamers (*Chauna derbiana*) from Columbia; a Chinese Water Deer (*Hydropotes inermis*); a Common Otter (*Lutra vulgaris*), British, deposited; two Black-tailed Hawfinches (*Coccothaustes melanurus*) from China, purchased.

ON THE SPECTRA OF COMETS[*]

THE spectrum-analytic method of examining the light from comets has only been applied hitherto to comets of weak light; yet the observations are fitted to extend considerably our knowledge of these objects. The spectra of all the comets that have been examined have consisted of a few bright lines or bands of light, and a very faint continuous spectrum. The chief part of the comet's light appears, accordingly, to be proper to it, and is probably from glowing gas, while the remaining portion is reflected sunlight.

Among the brightest comets which have appeared since the introduction of spectrum analysis are those of Brorsen (I. 1868) and Winnecke (II. 1868). The spectrum of the former consisted of three bright bands, whose position Huggins sought to determine with great accuracy; but he found no coincidence with the spectral lines of any terrestrial substance. The spectrum of Winnecke's comet, also examined by Huggins, was somewhat different, but similarly consisted of three bright bands (in addition to the continuous spectrum always present), which were sharply defined on the side nearest to the red end of the spectrum, but diffuse on the other. A comparison of the comet's spectrum with that of olefiant gas showed striking similarity between them; and Huggins was able to establish, with some certainty, a coincidence of the three bright bands. The expressed opinion that the material of this comet might be hydrocarbon found general acceptance; and the inference has been extended to other comets, so that it has been taken as demonstrated, that the comets are formed of hydrocarbons. (Dr. Zenker in *Astr. Nachr.* Nos. 1890 to 1893.)

I will now give a summary of all the observations known to me of cometary spectra, from which it will be seen how far the conclusion in question is warranted.

1. The first comet examined by spectrum-analysis is the Comet I. 1864. Donati found its spectrum to consist of three bright bands, which (if one may judge from the figure in *Astr. Nachr.* No. 1488) do *not* coincide with those of the hydrocarbon spectrum.

2. Huggins and Secchi observed Tempel's Comet I. 1866, and got from it a weak continuous spectrum, in which Secchi saw *three* bright lines, Huggins only *one* The line seen by both was the brightest, and situated in the middle between *b* and *F* of the solar spectrum; accordingly *no* coincidence with the hydrocarbon spectrum.

3. In the spectrum of Comet II. 1867, the continuous spectrum was relatively so strong that Huggins found it difficult to detect bright lines. "Once or twice," he says, "I suspected the presence of two or three bright lines, but of this observation I was not certain. The prismatic observation of this faint object, though imperfect, appears to show that this small comet is probably similar in physical structure to Comet I., 1866." In this case, again, probably no hydrocarbon.

4. Brorsen's Comet I. 1868, was observed by Huggins and Secchi. Both observed three zones of light; the middle one being brightest, and lying in the green; while its brightest part was somewhat less refrangible than the brightest line of the air spectrum (wave-length = 500·3 mill. millim.). From this observation, and the determination of the position of the other two faint bands, it appears that the comet spectrum was *neither* similar to that of *nitrogen*, nor to the *hydrocarbon spectrum*.

5. Winnecke's Comet II. 1868, was also observed by Huggins and Secchi. The measurements and direct comparisons of Huggins gave an agreement of the cometary spectrum with that of carbon in olefiant gas. From Secchi's measurements it appears, that the sharply defined side of the middle band (towards the red end), nearly coincided with the line-group *b* of the solar spectrum; at which part also the beginning of the middle band in the spectrum of hydrocarbons is situated.

6. Comet I. 1870 was observed by Wolf and Rayet; the spectrum consisted of three bright bands, whose position, however, was not accurately determined.

7. Comet I. 1871 was observed by Huggins and myself. Huggins found *three* bands, I only *two*. The measurements of the bands observed in common agree well; the spectrum appears to be identical with that of Brorsen's comet.

8. Comet III. 1871 (Encke) was observed by Huggins three days, by Young four, and by myself six; it showed, as usual, a spectrum of three bands. Huggins thought this agreed with

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[*] Abstract of paper in Poggendorff's Annalen, by H. Vogel.